

CASE REPORT

THE MANAGEMENT OF MID-PORTION ACHILLES TENDINOPATHY WITH ASTYM[®] AND ECCENTRIC EXERCISE: A CASE REPORTJoshua R. McCormack, MPT, OCS^{1,2}

ABSTRACT

Background and purpose: Mid-portion Achilles tendinopathy (AT) is a common injury among runners and recreational athletes. The conservative management of mid-portion AT typically includes eccentric exercise as recommended in multiple systematic reviews and practice guidelines. However, an eccentric program typically requires 12 weeks for satisfactory results and problems with compliance have been reported. Astym[®] is a non-invasive instrument assisted soft tissue treatment that can be used in the management of tendinopathies but there is limited published research on this treatment approach. The purpose of this case report is to present the management and outcomes of a patient with AT who was treated with eccentric exercise and Astym[®].

Case Description: The patient was a 56-year-old recreational tennis player referred to physical therapy with mid-portion AT of 6 weeks duration. Her primary complaints were pain with walking and an inability to play tennis. She was treated in physical therapy 2 times per week for 10 visits with treatment focused on Astym[®] and eccentric exercise.

Outcomes: By her 6th visit she subjectively reported being 75% functionally normal and was able to play a doubles tennis match. After 10 visits she reported that she was pain-free and able to play singles and doubles tennis without limitation.

Discussion: The patient in this case report was able to return to her normal activities after 5 weeks of treatment with Astym[®] and eccentric exercise. These results were achieved in less than half of the time commonly reported with eccentric exercise alone.

Conclusion: This case suggests that Astym[®] combined with eccentric exercise may be a beneficial treatment approach for patients with AT.

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BACKGROUND AND PURPOSE

Achilles tendinopathy (AT) occurs most commonly in runners with a prevalence of 11-18%,^{1,2} while recreational athletes and the general population are also at risk.^{3,4} Overall, AT accounts for up to 4% of visits to sports medicine clinics.² The most common site of injury is at the mid-portion of the tendon, but injury can also occur at the bone-tendon junction or the musculotendinous junction.⁵ Achilles tendinopathy often results in significant pain and dysfunction and can be difficult to manage.⁶

Eccentric exercise is commonly recommended in the management of mid-portion AT based on current literature.² Eccentric exercise has been found to result in favorable long term and short term results in the majority of cases.⁷⁻¹⁰ The most commonly studied eccentric protocol for mid-portion AT was described by Alfredson et al.¹¹ The Alfredson protocol requires patients to stand with their forefoot on the edge of a step with the ankle joint in full plantarflexion and to slowly lower themselves into full dorsiflexion using the affected limb only. A concentric contraction with the uninvolved limb is then used to return to the starting position.¹¹ This exercise is performed with the knee in extension and in flexion. Patients are instructed to perform 3 sets of 15 repetitions in each position per session and to perform 2 sessions per day for 12 weeks.¹¹ Patients are further instructed to add a weighted backpack when they are able to complete the exercise without discomfort. The Alfredson eccentric protocol has been reported to be more effective than concentric strengthening alone¹² and reported success rates have ranged from 56% in sedentary individuals¹³ to 89% in active individuals.¹⁴ Despite the promising findings in multiple studies, there are limitations to the clinical usefulness of the Alfredson program. One commonly cited limitation is the time required to complete the protocol. Patients are required to perform a total 6 sets of 15 repetitions twice daily for 12 weeks.¹¹ Roos et al reported that compliance decreased throughout the length of the program and by the twelfth week of the protocol only 50% of subjects reported good compliance with the eccentric exercises.¹⁵

Soft tissue mobilization has been proposed to help normalize tendon structure and is a recommended



Figure 1. *Astym® tools.*

treatment in the management of tendinopathies, though there is limited evidence supporting this approach.¹⁶⁻¹⁸ Instrumented assisted soft tissue mobilization (IASTM) techniques are frequently utilized to address soft tissue dysfunction. Astym® (Performance Dynamics, Muncie, IN, USA) is a specialized form of IASTM in which a specific treatment protocol utilizes handheld instrumentation (Figure 1) to transfer pressure and shear forces to the underlying dysfunctional soft tissue.¹⁹ With Astym® treatment the instruments are primarily moved along the direction of the underlying tissue. This is in contrast to cross friction techniques which apply pressure transverse to the underlying tissue. Astym® treatment includes specific protocols and instruments that are used to stimulate the tendon to attempt to affect tendon healing at the cellular level.²⁰⁻²² Astym® has been shown to cause increased fibroblast recruitment and activation in rat tendons, which could theoretically promote healing, but this has not been thoroughly studied in humans.²¹⁻²³

It is plausible that combining IASTM with the Alfredson protocol could lead to faster improvements during rehabilitation, but this has not been thoroughly studied. Two recently published case reports^{24,25} described good outcomes for patients with Achilles tendinopathy following treatment that included eccentric exercise and Graston, a form of IASTM. Another case report described excellent outcomes following treatment with Astym® and eccentric exercise for a patient with bilateral high hamstring tendinopathy.²⁶

While Astym® could theoretically be beneficial in the management of AT and improve outcomes when combined with eccentric exercise, this possibility

has not been studied. Therefore, the purpose of this case report is to present the management and outcomes of a patient with AT who was treated with eccentric exercise and Astym®.

CASE DESCRIPTION

Patient History

The patient was a 53-year-old female office worker referred to physical therapy with a diagnosis of left AT. Prior to her injury she was an active individual who played tennis several times per week and participated in spinning classes. Her pain began while playing tennis approximately 6 weeks prior, but she could not remember a specific event that caused her symptoms. The pain had continued to increase over time to the point she was unable to play tennis or participate in her spinning class. Her other functional limitations included pain with walking and pain with stairs. The patient was taking over the counter ibuprofen as needed for pain and no imaging was performed. Her medical history was reviewed and deemed to be non-significant. There was also no history of quinolone antibiotic usage.²⁷

Examination

During her initial physical therapy evaluation the patient reported pain that fluctuated from 0/10 at best to 8/10 at worst on the Numeric Pain Rating Scale (NPRS) during the previous 48 hours. She also completed the completed the Lower Extremity Functional Scale (LEFS) and scored a 70/80. The LEFS is a self-report questionnaire used to assess the function of patients with lower extremity orthopedic conditions.²⁸ The maximum total score is 80 and higher scores indicate higher level of function. The minimal clinically important difference (MCID) is 9 points.²⁸ Construct validity has been demonstrated with a good correlation between the LEFS and the SF-36 physical function subscale ($r = .80$) and a moderate correlation with the SF-36 physical component score ($r = .64$). Excellent test-retest reliability was also reported ($R = .94$).²⁸ The patient's primary complaint was pain in the left Achilles region during weight-bearing activities. The physical examination revealed tenderness to palpation along the mid-portion of the Achilles tendon however no edema, warmth, or Haglund's deformity was noted. Her ankle active range of motion (ROM) was within

normal limits and symmetrical except for dorsiflexion which was 16 degrees on the left and 22 degrees on the right. Active and passive dorsiflexion reproduced her left Achilles pain. ROM measurements were performed with the patient in supine with the knee extended. Manual muscle testing revealed 5/5 strength with dorsiflexion and inversion while plantarflexion strength was graded at 4/5 with pain and inversion strength was graded at 4+/5 with pain. A calf squeeze test was performed to rule out the possibility of a subcutaneous tendon rupture (sensitivity = .96)²⁹ and was found to be negative. Bilateral hip and knee strength was found to be within normal limits and symmetrical.

Assessment

The patient's symptoms were consistent with the referring diagnosis of AT. Specifically she was tender to palpation over the mid-portion of the Achilles tendon and symptoms were reproduced when the tendon was stressed. There were no significant findings at the hip or knees. Based on the authors experience with Astym® and the research on eccentric exercise the patient was believed to have a good prognosis and the initial plan of care was made for 6 weeks.

Intervention

After the initial evaluation Astym® treatment was initiated per the described protocol²³ (Figure 2) and the patient was instructed in a home exercise program (HEP). The HEP included eccentric calf raises



Figure 2. Astym® treatment. Image used with permission from Performance Dynamics, Inc.

as described by Alfredson et al¹¹ and calf stretches focused on the gastrocnemius and soleus muscles. One common complaint about the Alfredson program is that it causes severe muscle soreness, especially during the first few weeks of the program.¹⁵ Because of this, the patient was instructed to perform 2 sets of 10-20 repetitions with the knee straight and 2 sets of 10-20 repetitions with the knee flexed per session. She was also instructed to perform 2 sessions per day. This was equal to 4 less sets per day than described by Alfredson¹¹ but the author believed that this could increase compliance and decrease muscle soreness while the addition of Astym® and stretching would still allow for good outcomes.

The patient was treated in physical therapy 2 times per week for a total of 10 visits. Each follow up visit followed the same overall treatment progression (Table 1). An active warm up of 5 minutes on an elliptical trainer began each session. The patient also performed two 30-second bouts of stretching for the gastrocnemius and soleus muscles on a slant board before and after Astym®. Each Astym® treatment lasted approximately 10-15 minutes and followed the protocol described in the Astym® clinical manual.²³ Astym treatment involves using specially designed instruments (Figure 2) in a stroking motion along the skin while using a lubricant, such as cocoa butter, to reduce the coefficient of friction.^{23,30} The instruments

are primarily moved along the direction of the underlying musculoskeletal structures but multidirectional strokes are also used around bony areas. During each treatment session a progression of instruments with decreasing areas of surface contact are used.^{23,30} Each visit concluded with the patient performing eccentric heel raises. Initially the exercises were performed off the edge of a step as described by Alfredson,¹¹ but as the patient progressed they were performed on a leg press machine with increasing resistance. In the Alfredson protocol¹¹ a weighted backpack was used to progress the exercise, however this was not available at the clinic. Instead a leg press machine where the feet were placed on a stationary platform and the upper body moved on a sliding platform was used to increase the resistance. The exercises in the HEP did not change from what was initially prescribed.

OUTCOMES

The patient was seen for a total of 10 visits over a 5-week period and made good progress throughout that timeframe (Table 2). At her 4th visit she reported that she was 60% back to functionally normal and had been able to volley in tennis. By her 6th visit the patient reported being 75% back to functionally normal and that she was able to play a doubles match with only mild discomfort. At her 10th and final visit the patient reported that she was pain free and able to play singles and doubles tennis without limitation.

Table 1. Summary of Treatment Performed.	
Visit(s)	Intervention
1	Initial evaluation, Astym®, HEP consisting of: eccentric calf raises (2x10-20 per session with knee flexed and extended, 2x/per day, with instructions to increase resistance when able to perform without discomfort), calf stretching at wall with knee flexed and extended (2x30 seconds each per session, 3x/day)
2-5	1) Warm up on elliptical trainer (5 minutes) 2) Calf stretching on slant board with knee flexed/extended (2x30 seconds each) 3) ASTYM (10-15 minutes) 4) Eccentric calf raises on stairs with knee flexed/extended with body weight only (2x15 each) 5) Calf stretching on slant board with knee flexed/extended (2x30 seconds each)
6-10	Same as visits 2-5 except eccentric calf raises were performed on isotonic leg press machine (resistance was increased as she was able to perform without discomfort), patient discharged at 10 th visit
Abbreviations: HEP, home exercise program	

Table 2. Functional Outcomes Assessments.	
Visit	Functional Outcomes
4	Subjectively 60% back to normal, volley with minimal pain
6	Subjectively 75% back to normal, doubles match with minimal limitation
10	NPRS 0/10, LEFS 79/80, singles and doubles matches without limitation
Abbreviations: NPRS= Numeric Pain Rating Scale; LEFS= Lower Extremity Functional Scale	

Her LEFS score had improved to 79/80 and she was discharged with instructions to continue with her HEP for at least 2 more weeks.

DISCUSSION

Achilles tendinopathy is a common and often difficult to treat condition.⁶ However, there is a substantial amount of evidence to support the use of eccentric exercise in the management of mid-portion AT.^{11-15,31-34} The primary limitation with eccentric exercise is that favorable results can take up to 12 weeks to obtain and compliance problems have been reported.¹⁵ Astym® has also been proposed as a potentially effective treatment for AT but this has not been thoroughly studied. The patient in this case was treated with a combination of eccentric exercise and Astym® and was able to return to her normal activity level without pain in 5 weeks.

The results of this case suggest that Astym® combined with eccentric exercise may result in satisfactory outcomes in less time than traditionally reported with eccentric programs alone. However, the following limitations must be acknowledged. The time from symptom onset to treatment (1.5 months) for the patient in this case was shorter than the average symptom duration (5.5-19.2 months) reported in previous eccentric exercise studies.^{11-15,31-34} It could be argued that this patient responded faster because her symptoms were less chronic, however one of the previous studies included patients with a symptom duration of 1 month¹⁵ and two others included patients with a symptom duration of 3 months.^{11,12} It should also be noted that the patient had a relatively high score on the LEFS at the onset of treatment. It could be argued that her symptoms were mild enough that they would have improved without intervention. However, she had already had symptoms for 6 weeks and reported that they were worsening over time. This makes it less likely that she would have improved on her own but this cannot be ruled out. Other limitations to this

report include that no specific functional or motion analysis testing was performed and that strength testing was not repeated at the end of treatment.

As this is only a single-subject case report, it is impossible to generalize the results to other patients. Instead, the results of this case could provide a foundation for future research. Controlled studies are needed to compare the effects of combined Astym® and eccentric training to eccentric training alone in individuals with various levels of chronicity.

CONCLUSION

The patient in the case report had excellent outcomes following 5 weeks of treatment with Astym® and eccentric exercise. These results along with previously published case reports²⁴⁻²⁶ suggest that IASTM plus eccentric exercise may be an effective treatment approach for tendonopathies. Further controlled studies are warranted.

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